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ABSTRACT

A method of developing and improving curriculum exemplified by the Biological Sciences Curriculum Study (BSCS) is described. BSCS is a self-governing, independent, nonprofit organization of biologists and teachers devoted to the improvement of biological education. This group is involved in an ongoing, continuous project with rotating personnel. Its purpose is to develop curriculum and produce textbooks that are under constant study and revision. While the initial work of the group is given federal funds, the textbooks are placed in the commercial marketplace and sold through traditional channels to secondary schools. (JD)

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A Lesson from BSCS Experience

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ABSTRACT

Four methods of developing and improving curricula are discussed. The fourth method is exemplified by the BSCS which is a self-governing, independent, non-profit organization of biologists and teachers devoted to the improvement of biological education. The BSCS is analogous to an author who is self-supporting through the sales of his textbooks, and other products, through commercial publishers and other traditional suppliers.

The success of the BSCS is directly related to the acceptance of its materials by local school boards using their own criteria for selection.

The advantages of this method are that the content of the courses is free of political and economic influence to a far greater extent than curricula produced by current methods; that selection of classroom materials remains the prerogative of local school systems; that the free-enterprise system of marketing of educational materials is unaffected; and that the materials themselves have been classroom-tested and had been prepared by outstanding scholars and teachers in the discipline.

It is recommended that the NIE encourage and support the establishment of such "fourth method" curriculum groups in a wide variety of fields.

A LESSON FROM BSCS EXPERIENCE

A number of lessons could be learned from the experience of the Biological Sciences Curriculum Study that might contribute to the development of NIE policies. In this paper I want specifically to emphasize the potential value to our nation of a series of relatively permanent curriculum development groups, as exemplified by the BSCS, and the role the NIE might play in sponsoring such groups. The following outline of that single major theme also suggests, tangentially, responses to a number of the questions raised in the "NIE Curriculum Policy Discussion Guide."

Introduction

During the 1950's, many educators were complaining about the inadequacies of science education at the secondary level in the United States. Little else was done until Dr. Jerrold Zacharias of MIT, to his everlasting credit, prevailed upon the then Director of the National Science Foundation, Dr. Alan Waterman, and his associates, to fund a curriculum development program, the Physical Science Study Committee, through which mechanism a group of top-notch physical scientists devoted themselves to the task of preparing a physics course for secondary school students. (It should be noted, in passing, that the PSSC was established several months prior to the launching of the first Sputnick in 1957 and thus was not, as many have contended, an American reaction to the Soviet accomplishment.)

Within a very few years, the NSF and, to a lesser degree, the U. S. Office of Education, were supporting curriculum development groups in mathematics (School Mathematics Study Group), chemistry (Chemistry Study and Chemical Bond Approach), and biology (Biological

Sciences Curriculum Study). Later a second project in physics (Harvard Project Physics) was initiated, as well as a project in the earth sciences, several in elementary and intermediate science, and many smaller projects in geography, geology, anthropology, economics, sociology, and other areas. Most or all of these projects received federal funding for curriculum development work. To be sure these groups were not the first to attack curriculum development through a team approach (e.g., with some federal funding the University of Illinois Committee on School Mathematics, under the leadership of the late Max Beberman, had been doing so since 1951), but the curriculum study groups of the late 1950's and the 1960's represented the first concerted effort to attack the problem of inadequate science curricula through nationwide, federally-supported, course improvement programs.

A typical curriculum study of this type consisted of a large and representative group of outstanding university specialists in a discipline, pedagogical experts, and a number of school teachers of the grades and disciplines involved. Normally the group would convene for a succession of summers, during which it would prepare drafts, and revised drafts, of instructional materials including textbooks, films, laboratory equipment, examinations, and other paraphernalia which then were tested during the intervening academic years in live and varying classroom situations across the country. After each year's use, the materials were subject to revision based on evaluation of the classroom experiences. After two or more sets of field tests, and after the curriculum group was reasonably satisfied, the materials generally were released to commercial textbook houses for publication.

Thereafter, the published materials prospered or faltered in the

open marketplace as do the curriculum materials prepared by traditional methods. Not only did the curriculum project materials offer an alternative to traditionally prepared materials, but they also varied among themselves: there were two physics courses produced by two different curriculum groups; two chemistry courses produced by two different chemistry groups; three different versions of a high school biology course produced by three BSCS teams; and several different elementary and intermediate science and mathematics programs. Thus federal financing served to increase the array and diversity of science and mathematics curriculum materials from which schools could select according to their own locally-established criteria.

The role of the competitive marketplace for commercially published textbooks remained virtually unchanged; what had changed was that a new kind of author (curriculum study group) joined the existing individual writers and in-house editors traditionally employed by publishers.

The BSCS programs in biology have been highly successful. Nearly 4.5 million copies of the three BSCS version textbooks have been sold to date by three commercial publishers and today more than half of all high school students learn their biology from the BSCS materials. (The remainder, presumably, uses the 25 or more textbooks published by the other publishing companies; some of those books are modeled closely on the BSCS volumes.) A number of college and university biology departments have been excusing from their elementary college biology course students who studied a BSCS course in high school. The first students to use the BSCS editions published in 1963 are now young adults in their late twenties and early thirties. It is possible that the upsurge in citizens' interests in ecology and conservation during recent

years has been due in part to the impact of the BSCS textbooks since each version includes interesting, extensive, and sophisticated modern treatments of ecological principles.

There is one important procedural difference between the BSCS and the other major curriculum projects. The latter, for the most part, have taken the position that with the production of model courses, their work has been completed. The participants in those developmental projects have felt that they had taken time out of their lives to make a major contribution to education in their disciplines and, having done so, should thereafter return to their preferred activities--most often university teaching and research.

The BSCS, however, concluded that it should develop into an ongoing, continuous project with rotating personnel. The reasons for this decision were many: curriculum revision, itself, is a never-ending process; many school systems and teachers have made a serious investment in, and commitment to, the BSCS programs and that investment would eventually be lost if the BSCS materials were to go unrevised or unattended; biologists have a continuing obligation to contribute to the education of young people in the field; and, finally, the removal of BSCS curricular materials from the marketplace would permit high school biology to regress to the state of the art which the BSCS was established to correct in the first place. Thus, in 1968, the BSCS elected to become an ongoing, independent project.

Curriculum Development Methods

Aside from locally organized courses by teachers and supervisors, there appear to be four major methods by which curricula are prepared for broad use in a nation's schools.

The first method is that of many European, Asian, and Latin American countries. Under guidelines formulated by the Ministry of Education, a number of publishers produce textbooks for use in the schools. While the marketing often may be competitive, the content of the curriculum is under close governmental control. This method has been rejected in the United States as not consonant with an open and democratic society, for it results in a national curriculum imposed by the federal government.

The second method was found in undiluted form in the United States prior to the curriculum project movement and remains today as the dominant method for most subjects. The way it works is for commercial publishers to take the initiative. Any publisher can produce a textbook which, eventually, will succeed or fail in the marketplace quite independent of governmental control. While this method appears to be a free and open system without constraints, in practice it is not. Most publishers, in the first instance, attempt to produce the most educationally sound textbook they can and take genuine pride in doing so. But when their sales representatives attempt to sell such a book to a national market, they often meet resistance to various aspects of the content of the book. In one community a school superintendent, or a teacher or supervisor

appointed to a textbook selection committee may say to a publisher's representative that the company's new biology book is very good but the chapter on evolution will offend some of the members of the community, and so the school system will not buy that book. In a different part of the country, someone else may say to another representative of the same publisher that he is unwilling to recommend using a book with a such a frank discussion of human reproduction. In states that make statewide adoptions of textbooks, the concerns may be similar but the impact multiplied a hundredfold. Thus, in order to maximize sales, the sales representatives will urge their publisher to eliminate potentially offending passages (quite independent of their educational value) and the publisher, for each urging, will be forced to choose between what he believes is good education and what he recognizes as the legitimate interests of the comapny's stockholders. Furthermore, he will realize that if he does not accommodate this marketplace pressure, other publishers will. Thus, inexorably, American high school textbooks tend to become "safe" or non-controversial--both increasingly dull and increasingly out of touch with the issues of the real world. This marketplace control of content is most marked in school textbooks designed for courses with significant political and social content (history, civics, literature) and least marked in the physical sciences (physics, chemistry) and mathematics. Biology seems to be intermediate.

The third method of curriculum development is the curriculum project method, outlined above in broad terms. In essence it is

similar to the first two methods in that it provides for open competition among publishers in the marketing of textbooks. However, the method succeeds in effectively removing control of the content of the curriculum from both political (ministry) and economic (marketplace) influences and placing that control primarily in the hands of scholars and teachers of the discipline. While this is an eminently satisfactory method for an open society (it places content control in the hands of teachers and scholars and provides that production and distribution remain responsive to marketplace competition), it has the disadvantage of being a one-shot approach. The NSF has taken the posture, correctly or not, that its proper role in curriculum development is to support attempts to produce curriculum models but not to support dissemination efforts or to support required new in-service training programs for teachers on a continuing basis.

A great strength of the BSCS is that, under that particular set of circumstances, it has pioneered in the development of a <u>fourth method</u> which appears to meet all the requisites for curriculum development appropriate for a free and democratic society. That method has evolved directly from the curriculum project (third) method and involves governance of the BSCS project by a board of representative biologists who control the policies of a not-for-profit corporation. Some products of the BSCS have proved so successful in the marketplace that publishers provide secondary grants and the BSCS board assigns those funds to continuing the dissemination and revision activities for those programs. Programs

not developed with federal grants may, in some instances, return royalties that the BSCS uses either in dissemination activities or in new program investigations for the further improvement of biological education.

In this way the BSCS has evolved into a nonprofit corporation of biologists dedicated to the improvement of biological education. The NSF funding of the BSCS in its developmental years is currently being replaced by grants from publishers and royalty earnings from BSCS products. Thus the BSCS has become financially self-supporting and, presumably, will continue to remain self-supporting so long as its educational materials find acceptance by the local school districts of the United States.

This fourth method of curriculum development has these advantages:

(1) The course content is virtually free of political and economic manipulation and is under the control of the scholars and teachers of the discipline;

(2) The materials are the results of extensive evaluation in representative classroom situations;

(3) The selection of course materials for classroom use remains the prerogative of the local school systems;

(4) The traditional roles of textbook publishers, and other educational suppliers, in an open competitive market-place remain fundamentally unaltered; and

(5) Federal funding is used for start-up monies without continuing obligations on the part of the federal agency to any one project.

A Role For The NIE

Briefly stated, the NIE should encourage the establishment of "fourth method" curriculum development groups.

In its evaluation of proposals from groups that might eventually become "fourth method" curriculum developers, the NIE should satisfy itself:

(1) that the membership of the group is appropriately balanced with regard to the discipline or interest it represents; that there are protections against domination of the group by special pleaders;

(2) that adequate evaluation procedures have been built into the proposal;

(3) that there are appropriate provisions for teacher training;

(4) that acceptable methods are proposed for the assignment to commercial distributors of materials that are developed;

(5) that NIE staff will be precluded from influencing the content of the materials produced by the group; and

(6) that local school districts, or other potential consumers of the materials, will not be subject to undue influence by the curriculum development group or by the NIE.

I recommend that a major role of the NIE be the encouragement and support of "fourth method" curriculum development groups. I know of no way in which federal dollars could be used more effectively and efficiently for the improvement of education within our American traditional value systems.